

AMENDMENTS TO THE CLAIMS

1. (currently amended) A single-mode optical fiber suitable for a WDM (Wavelength Division Multiplexing) system, comprising:

(a) a first core region positioned in the center of cross section and having a radius r_1 from the center and a relative refractive index difference Δ_1 ;

(b) a second core region surrounding the first core region and having a radius r_2 from the center and a relative refractive index difference Δ_2 ;

(c) a third core region surrounding the second core region and having a radius r_3 from the center and a relative refractive index difference Δ_3 ; and

(d) a clad region surrounding the third core region and having a radius r_4 from the center and a relative refractive index difference Δ_4 ,

(e) wherein the radii of the regions have a relation of $r_1 < r_2 < r_3 < r_4$, and the relative refractive index differences of the regions have relations of $\Delta_1 > \Delta_2$, and $\Delta_2 < \Delta_3$;

(here, $\Delta_1(\%) = [(n_1 - n_c)/n_c] \times 100$, $\Delta_2(\%) = [(n_2 - n_c)/n_c] \times 100$, $\Delta_3(\%) = [(n_3 - n_c)/n_c] \times 100$, n_1 : a ~~reflective~~ refractive index of the first core region, n_2 : a ~~reflective~~ refractive index of the second core region, n_3 : a ~~reflective~~ refractive index of the third core region, n_c : a ~~reflective~~ refractive index of the clad region)

(f) wherein the optical fiber uses a wavelength region from 1460 to 1625 nm, and has a dispersion value of 0.1 to 3.0 ps/nm-km at 1460 nm, 3.0 to 5.5 ps/nm-km at 1550 nm, and 4.5 to 8.0 ps/nm-km at 1625 nm.

2. (original) The single-mode optical fiber according to claim 1,
wherein the optical fiber has a positive dispersion slope in the wavelength band for use.

3. (currently amended) The single-mode optical fiber according to claim 2,
wherein the optical fiber has a dispersion slope of 0.023 to 0.05 ps/nm²-km² at 1550 nm.

4. (original) The single-mode optical fiber according to claim 3,
wherein the optical fiber has an effective section area of 35 to 50μm² at 1550 nm.

5. (original) The single-mode optical fiber according to claim 3,
wherein the optical fiber has an effective section area of 35 to 50μm² at 1460 nm.

6-11. (cancelled)

12. (original) The single-mode optical fiber according to claim 1,
i) wherein the first core region has a radius $r_1=3.05\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_1(\%)=0.54\pm0.03\%$;
ii) wherein the second core region has a radius $r_2=5.38\pm0.6\mu\text{m}$ and a refractive index difference $\Delta_2=-0.20\pm0.03\%$; and
iii) wherein the third core region has a radius $r_3=9.96\pm0.6\mu\text{m}$ and a specific refractive index difference $\Delta_3=0.07\pm0.03\%$.

13. (original) The single-mode optical fiber according to claim 1,

i) wherein the first core region has a radius $r_1=3.05\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_1(\%)=0.55\pm0.03\%$;

ii) wherein the second core region has a radius $r_2=5.75\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_2=-0.18\pm0.03\%$; and

iii) wherein the third core region has a radius $r_3=10.79\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_3=0.09\pm0.03\%$.

14. (original) The single-mode optical fiber according to claim 1,

i) wherein the first core region has a radius $r_1=3.12\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_1(\%)=0.53\pm0.03\%$;

ii) wherein the second core region has a radius $r_2=5.56\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_2=-0.23\pm0.03\%$; and

iii) wherein the third core region has a radius $r_3=9.92\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_3=0.10\pm0.03\%$.

15. (original) The single-mode optical fiber according to claim 1,

i) wherein the first core region has a radius $r_1=3.24\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_1(\%)=0.48\pm0.03\%$;

ii) wherein the second core region has a radius $r_2=5.72\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_2=-0.17\pm0.03\%$; and

iii) wherein the third core region has a radius $r_3=8.54\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_3=0.15\pm0.03\%$.

16. (original) The single-mode optical fiber according to claim 1,

i) wherein the first core region has a radius $r_1=3.37\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_1(\%)=0.50\pm0.03\%$;

ii) wherein the second core region has a radius $r_2=5.77\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_2=-0.25\pm0.03\%$; and

iii) wherein the third core region has a radius $r_3=9.35\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_3=0.14\pm0.03\%$.

17. (original) The single-mode optical fiber according to claim 1,

i) wherein the first core region has a radius $r_1=3.18\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_1(\%)=0.51\pm0.03\%$;

ii) wherein the second core region has a radius $r_2=6.18\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_2=-0.19\pm0.03\%$; and

iii) wherein the third core region has a radius $r_3=8.65\pm0.6\mu\text{m}$ and a relative refractive index difference $\Delta_3=0.14\pm0.03\%$.

18. (currently amended) A single-mode optical fiber suitable for a WDM (Wavelength Division Multiplexing) system, comprising:

(a) a first core region positioned in the center of cross section and having a radius r_1 from the center and a relative refractive index difference Δ_1 ;

(b) a second core region surrounding the first core region and having a radius r_2 from the center and a relative refractive index difference Δ_2 ;

(c) a third core region surrounding the second core region and having a radius r_3 from the center and a relative refractive index difference Δ_3 ; and

(d) a clad region surrounding the third core region and having a radius r_4 from the center and a relative refractive index difference Δ_4 ,

(e) wherein the radii of the regions have a relation of $r_1 < r_2 < r_3 < r_4$, and the relative refractive index differences of the regions have relations of $\Delta_1 > \Delta_2$, and $\Delta_2 < \Delta_3$;

(here, $\Delta_1(\%) = [(n_1 - n_c)/n_c] \times 100$, $\Delta_2(\%) = [(n_2 - n_c)/n_c] \times 100$, $\Delta_3(\%) = [(n_3 - n_c)/n_c] \times 100$, n_1 : a ~~reflective~~ refractive index of the first core region, n_2 : a ~~reflective~~ refractive index of the second core region, n_3 : a ~~reflective~~ refractive index of the third core region, n_c : a ~~reflective~~ refractive index of the clad region)

(f) wherein the optical fiber uses wavelength region from 1460 to 1625 nm, and has a dispersion value of 0.1 to 3.0 ps/nm-km at 1460 nm, 3.0 to 5.5 ps/nm-km at 1550 nm, and 4.5 to 8.0 ps/nm-km at 1625 nm;

(g) wherein a dispersion slope at 1550 nm is 0.023 to 0.05 ps/nm²-km²;

(h) wherein an effective section area at 1550 nm is 35 to 50 μm^2 .

19. (original) The single-mode optical fiber according to claim 18,

wherein the optical fiber has an effective section area of 35 to 50 μm^2 at 1460 nm.

20. (original) The single-mode optical fiber according to claim 18,

herein the optical fiber has a cutoff wavelength of 1450 nm or below.

21. (original) The single-mode optical fiber according to claim 18,

wherein a zero-dispersion wavelength is located at 1460 nm or below.

22. (original) The single-mode optical fiber according to claim 18,

wherein the optical fiber has a dispersion value of 0.3 to 2.4 ps/nm-km at 1460 nm.

23. (original) The single-mode optical fiber according to claim 18,

wherein the optical fiber has a dispersion value of 3.2 to 5.2 ps/nm-km at 1550 nm.

24. (original) The single-mode optical fiber according to claim 18,

wherein the optical fiber has a dispersion value of 4.8 to 7.7 ps/nm-km at 1625 nm.

25. (original) The single-mode optical fiber according to claim 18,

wherein a bending loss is 0.5dB or less at 1625 nm under the condition of a bending radius of 30mm, 100turns.

26. (currently amended) An optical transmission line ~~in which the single-mode optical fiber defined in any of claims 1 to 18 is adopted~~ comprising at least in part the optical fiber according to claim 1.

27. (currently amended) An optical transmission system ~~having in which the optical transmission line defined in claim 26 is adopted in at least a part of an optical transmission path~~ comprising at least in part the optical transmission line according to claim 26.

28. (new) The single-mode optical fiber according to claim 4,

wherein the optical fiber has a cutoff wavelength of 1450 nm or below.

29. (new) The single-mode optical fiber according to claim 5,

wherein the optical fiber has a cutoff wavelength of 1450 nm or below.

30. (new) The single-mode optical fiber according to claim 4,

wherein a zero-dispersion wavelength is located at 1460 nm or below.

31. (new) The single-mode optical fiber according to claim 5,

wherein a zero-dispersion wavelength is located at 1460 nm or below.

32. (new) The single-mode optical fiber according to claim 4,

wherein the optical fiber has a dispersion value of 0.3 to 2.4 ps/nm-km at 1460 nm.

33. (new) The single-mode optical fiber according to claim 5,

wherein the optical fiber has a dispersion value of 0.3 to 2.4 ps/nm-km at 1460 nm.

34. (new) The single-mode optical fiber according to claim 4,

wherein the optical fiber has a dispersion value of 3.2 to 5.2 ps/nm-km at 1550 nm.

35. (new) The single-mode optical fiber according to claim 5,

wherein the optical fiber has a dispersion value of 3.2 to 5.2 ps/nm-km at 1550 nm.

36. (new) The single-mode optical fiber according to claim 4,

wherein the optical fiber has a dispersion value of 4.8 to 7.7 ps/nm-km at 1625 nm.

37. (new) The single-mode optical fiber according to claim 5,

wherein the optical fiber has a dispersion value of 4.8 to 7.7 ps/nm-km at 1625 nm.

38. (new) The single-mode optical fiber according to claim 36,

wherein a bending loss is 0.5dB or less at 1625 nm under the condition of a bending radius of 30mm, 100turns.

39. (new) The single-mode optical fiber according to claim 37,

wherein a bending loss is 0.5dB or less at 1625 nm under the condition of a bending radius of 30mm, 100turns.